WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2004VT16B

Title: A Comparison of Bacterial Concentrations in Streams: a Paired Watershed Study

Project Type: Research

Focus Categories: Non Point Pollution, Surface Water, Hydrology

Keywords: fecal contamination, E. coli, coliform, stream discharge, water quality, watersheds, remote sensing, GIS

Start Date: 03/01/2005

End Date: 02/28/2006

Federal Funds: $28,886

Non-Federal Matching Funds: $45,371

Congressional District: First

Principal Investigators:
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Abstract

Throughout the U.S., high-elevation forested watersheds are facing the pressures of development for increased housing, year-round recreational use, water management, and timber. Towards improving our understanding of how development-related disturbances may affect these highly sensitive ecosystems, the proposed research will address fecal contamination in relation to hydrologic and sediment loading responses in paired undeveloped and developed watersheds within a northeastern high-elevation forest.

Runoff from residential, agricultural, and forested lands carrying microorganisms from fecal sources can pose a serious risk to human health through contamination of drinking and recreational waters. Uncertainties in the relative importance of these fecal sources, however, have constrained federal and state agency efforts to understand and manage water quality. In particular, although bacteria levels in streams are strongly correlated with development and agricultural runoff, there is considerable debate regarding the contribution of undeveloped areas (which in the northeastern U.S. often are represented by higher elevation forested lands). Limited observations, however, suggest that fecal

bacteria in streams draining undeveloped forest lands may significantly contribute to downstream concentrations and may exceed water quality standards during storm events. To date, however, no studies have addressed bacterial contamination in streams draining high-elevation forested watersheds in the northeastern U.S.

The proposed study offers a unique opportunity to address these uncertainties by quantifying stream bacteria levels in paired, forested watersheds on Mt. Mansfield in northern Vermont. The overall goal of this research is to assess the contribution of developed and undeveloped forested lands to bacterial contamination of adjacent streams, providing improved understanding of downstream water quality and a baseline for planned future development of the study area. Access to near-real-time meteorological and stream gage data will further allow quantification of the relationship between stream discharge, sediment loading, and bacteria concentrations. Such information is critical if we are to understand the factors contributing to water quality in northeastern forested regions and to assess current and proposed changes to the Vermont water quality standards. The proposed analyses will combine in situ water sampling of E. coli (a fecal indicator), stream gage data, analysis of land use/land cover updated with high resolution satellite imagery, and hydrological modeling within a GIS framework. Collaboration with recently initiated efforts by Drs. J. Shanley (USGS) and B. Wemple (University of Vermont) will facilitate an integrated and cross-disciplinary assessment of how ski-area development may affect the hydrology, and environmental and water quality of these ecosystems.